The MATHEMATICAL ASSOCIATION of AMERICA
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YOUR REF: ONR Grant No. N00014-94-1-0383

To: Andre van Tilborg

From: Marcia P. Sward/mac

At the request of Dr. Marcia Sward, I am enclosing a copy of the performance report for ONR Grant N00014-94-1-0383. The report concerns activities of the 1994 MOSP (Mathematical Olympiad Summer Program) held at the U.S. Naval Academy from June 6 to July 6, 1994.

M. A. Callanan, Development Assistant

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ONR Grant Number N00014-94-1-0383

REPORT OF
MATHEMATICAL OLYMPIAD SUMMER PROGRAM (MOSP) '94

The 1994 MOSP was held at the United States Naval Academy from June 6 to July 6. Twenty-four students participated in the program with a staff of 3 faculty and two graders. (See attached for listing of participants and staff.) Overall, the session went very smoothly and was judged to be quite successful.

The daily schedule was somewhat different from previous sessions. Lectures (see attached for schedule), followed by a problem session, were given at 9 a.m., 11 a.m. and 1:30 p.m. At most of the lecture hours, an introductory and an advanced lecture, usually on different topics, were given. It would have probably been better to have the same topic covered simultaneously, however; the topics were divided among the three faculty and it was not feasible to have two different people develop a set of lectures on the same topic. Each night students were asked to indicate which lectures they would attend the next day and the students were very wise and thoughtful in their choices. Students and staff felt that this format was beneficial to all and better than a single lecture for everyone.

Three afternoons a week, Monday, Wednesday and Friday, the students took a three-question three-hour test, while on Thursday afternoons there were guest lecturers--Dan Ullman from George Washington University and Don Coppersmith from IBM. On Saturday mornings the six team members, the two alternates and any other participant who wanted to, took an IMO-type test which lasted 4.5 hours. On Sunday afternoons, there was either a team competition or a guest lecturer--Okansa Lassowsky and Bjorn Poonen.

The graders, Kiran Kedlaya and Lenny Ng, did an excellent job. Each lectured twice during the session and were prompt and thorough in their grading. The students truly benefited from the help and attention they got from Kiran and Lenny.

The participants were enthusiastic and, despite the spartan surroundings, appeared to enjoy the session. A lack of air conditioned quarters during an incredible heat wave made things very uncomfortable but we heard minimal complaints. In addition, there was no good place for the students to relax, play cards, play chess, etc., but, with their typical ingenuity, the participants created a spot in the dorm's corridor which served as a gathering place during free time.

All in all I would judge the 1994 session to be quite successful. Everyone, students and staff, worked extremely hard, morale was good, no major disasters occurred and the results from the IMO competition in Hong Kong indicate that we must be doing something right!

Submitted by Anne L. Hudson,
Director 1994 MOSP

PARTICIPANTS AND STAFF
1994 MATHEMATICAL OLYMPIAD SUMMER PROGRAM
U.S. NAVAL ACADEMY , ANNAPOLIS, MD
JUNE 7- JULY 6, 1994

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LECTURE SCHEDULE
1994 MATHEMATICAL OLYMPIAD SUMMER PROGRAM

WEDNESDAY JUNE 8

NO SPLIT SESSIONS

9 Kiran and Lenny

11 Walter Mientka

2 Introduction to writing proofs (K and L and whoever)

4-6 Split sessions on proof-writing- (Maybe 3,4 or 5 small groups)

THURSDAY JUNE 9

	Level I	Level II
9	P-Inclusion/Exclusion I	A-Generating Functions I
11	A-Generating Functions I	P-Inclusion/Exclusion IA
2	T-Symmetry	

FRIDAY JUNE 10

	Level I	Level II
9	A- Elementary Trfs. I	P-Some Sums
11	P- Pigeon Hole I	T-Pigeon Hole IA
2	T- Inequalities I	A-Elementary Trfs. IA

SATURDAY JUNE 11

"IMO" Exam for team and other takers.

SUNDAY JUNE 12

Visiting lecturer in afternoon-Oksana Lassowsky.

MONDAY JUNE 13

NO SPLIT SESSIONS

9 VISITING LECTURER-Lassowsky

11 Kiran

2 Lenny

TUESDAY JUNE 14

	Level I	Level II
9	A-Elemtary Trfs. II	P-Recurrance rels. IA
11	T-Trig I	A-Similarities
2	P-Recurrance rels.I	T-Trig IA

WEDNESDAY JUNE 15

	Level I	Level II
9	P-Binomial coeff. and Stirling numbers	A-Parallel Projections!
	T-Extremal arguments I	P-Combinatorial Geom. IA
2	A-Inversion	T-Extremal arguments

THURSDAY JUNE 16

	Level 1	Level 2
9	P-Combinatoric Args II	A-Central Projections
11	P-Number Theory I	T-Functional Eqs IA
2	A-Parallel Projections	T-Let's Count

4-Dan Ullman

FRIDAY JUNE 17

	Level 1	Level 2
9	A-Linear Algebra	T-The 2n-1 Problem
11	P- Number Theory II	T-The 2n+1 Problem
2	P-Combinatorics III	A-Linear Algebra IA

SATURDAY JUNE 18
"IMO" Exam for team and other takers

SUNDAY JUNE 19
4:00-6:00 First Team Contest-Session 1
7:00-9:00 First Team Contest-Session 2

MONDAY JUNE 20

	Level 1	Level 2
9	P-Graph Theory	A-Linear Algebra IIA
11	T-Old Fashioned Geometry	P-Graph Theory
2	A-Linear Algebra II	T-Old Fashioned Geometry

TUESDAY JUNE 21

	Level 1	Level 2
9	A-Linear Algebra III	P. Graph Theory II
11	P-Graph Theory II	T-Polynomials. A
2	T-Vectors I	A-Dual Spaces, etc.

WEDNESDAY JUNE 22

	Level 1	Level 2
9	P-Number Theory III	A-Geometry/Linear Algebra
11	T-More Geometry	P-Advanced Non-IMO Talk
2	A-Dissection Theory	T-Elementary Number Theory
4	Genevieve Knight, Bill Hawkins, Marcia Sward	

THURSDAY JUNE 23

	Level 1	Level 2
9	P- Number Theory IV	A-Polynomials
11	P-Comb. Geometry	T-Multiplicative Functions
2	A-Polynomials I	T-Morse's Sequence

FRIDAY JUNE 24

	Level 1	Level 2
9	T-Congruence I	A-Determinants IA
11	A-Polynomials II	T-Congruence IIA
2	No Split Sessions--General Talk by Paul-Random Walks	

SATURDAY JUNE 25
"IMO" Test for team and other takers.

SUNDAY JUNE 25

	Level 1	Level 2
10	Kiran-Brianchon	P-Complex Numbers/Geometry
11:15	T-Geometry	Kiran-Brianchon
1:30	No Split Sessions--Anne on Coordinate Systems	
6:30	Mat-Boy Team Contest-	

MONDAY JUNE 27

No Classes--Trip to D.C.

TUESDAY JUNE 28

	Level 1	Level 2
9	P-Comb Geom II	A-Projective Geometry
11	T-NumberTheory	P-Comb Geom I
2	A-Projective Geometry I	T-Number Theory

WEDNESDAY JUNE 29

	Level 1	Level 2
9	A-Triangles I	P-Graph theory III
11	P-Complex #'s and Geom.	T-Circle/Radical Axis IA
2	T-Circle/Radical Axis II	A-Terrific Triangle Theorems
4	Don Coppersmith--IBM	

THURSDAY JUNE 30

	Level 1	Level 2
9	T-Vector Geometry II	A-Triangles and Points
11	P-Graph Theory IV	T-Geo. Inequalities IIA
2	A-Triangles	P-Baire Category Theorem

FRIDAY JULY 1

	Level 1	Level 2
9	P-Banach Tarski Paradox	T-Vector Geometry IA
11	A-Triangles+ Circles	P-Banach-Tarski Paradox
2	T-Inversive Geometry II	A-Monthly Problems

SATURDAY JULY 2

"IMO" Test for team and other takers

SUNDAY JULY 3

4 Visiting lecturer--Bjorn Poonen

MONDAY JULY 4

NO SPLIT SESSIONS

9 Visting Lecturer--Poonen

11 Lenny

1:30 Kiran

2:30 Rookie Team Contest

TUESDAY JULY 5

NO SPLIT SESSIONS--Student Talks

Alex Khazanov

Jacob Lurie

Jonathan Weinstein

Ted Hwa

The MATHEMATICAL ASSOCIATION of AMERICA
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FOR IMMEDIATE RELEASE
Mailed: July 18, 1994

Contact:
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- US Team Makes History -

US PLACES FIRST IN INTERNATIONAL MATHEMATICAL OLYMPIAD

(Washington, DC) . . . . . Competing against teams representing 69 countries, a team of six American high school students placed first in the 35th International Mathematical Olympiad (IMO), held July 8-20 in Hong Kong with six perfect scores.

This is the first time in the 35 year history of the Olympiad that any team has achieved a perfect score. Each of the 6 members of the U.S. IMO team scored the maximum number of points (42) on the 9-hour competition and each received a gold medal.

The members of the team are:
Jeremy Bem, Ithaca High School, Ithaca, NY
Aleksandr L. Khazanov, Stuyvesant High School, New York, NY
Jacob A. Lurie, Montgomery Blair High School, Silver Spring, MD
Noam M. Shazeer, Swampscott High School, Swampscott, MA
Stephen S. Wang, Illinois Mathematics and Science Academy, Aurora, IL
Jonathan Weinstein, Lexington High School, Lexington, MA

The top 5 teams are, in order: the U.S.A., China, Russia, Bulgaria, and Hungary.

Professor Walter E. Mientka, from the University of Nebraska-Lincoln, Executive Director of the American Mathematics Competitions, and leader of the team said, "I am very proud of the performance of our team. Each member demonstrated great mathematical creativity and was an outstanding representative of the United States."

A representative question which appeared on the 35th IMO is as follows:

> Show that there exists a set A of positive integers with the following property: For any infinite set S of primes there exist two positive integers m in A and n not in A each of which is a product of k distinct elements of S for some k greater than 1.

-more-

Prior to the competition, the U.S. students participated in a month long summer program at the U.S. Naval Academy under the direction of professors Anne Hudson, Titu Andreescu and Paul Zeitz.

The U.S. team was chosen on the basis of performance in the Twenty-third Annual United States of America Mathematical Olympiad (USAMO) held earlier this year. The winners of the 1994 USAMO were honored on June 6 at the National Academy of Sciences in Washington, DC.

The Mathematical Olympiad is a program of the Mathematical Association of America. It is co-sponsored by the following national organizations in the mathematical sciences:

American Association of Pension Actuaries
American Mathematical Association of Two-Year Colleges
American Mathematical Society
American Statistical Association
Casualty Actuarial Society
Mathematical Association of America
Mu Alpha Theta
National Council of Teachers of Mathematics
Society of Actuaries

Financial support is provided by the Army Research Office, the Office of Naval Research, Microsoft Corporation, and the Matilda R. Wilson Fund.

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The U.S. IMO team arrives back in the U.S. from Hong Kong on Wednesday, July 20, on United Airlines flight #2 arriving at Los Angeles International Airport at 10:05 am (PDT).

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Technical Objective:
The objective is to prepare a team of U.S. High school students to compete in the International Mathematical Olympiad (IMO) held in Hong Kong July 8-20, 1994. Those selected are introduced to a wide range of mathematical problems and theory at the Mathematical Olympiad Summer Program (MOSP) held at the U.S. Naval Academy June 7 - July 6, 1994.

The U.S. Team placed first among all competing nations in Hong Kong, with 6 perfect scores.

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